SUBSTATION VACUUM/SF6 BOTTLE CIRCUIT BREAKER INSTALLATION

Version 7

PacifiCorp Substation Technical Services Form SF-CKB-BOTTLE-INST

Refer to PacifiCorp procedure SP-CKB-BOTTLE-INST

The person(s) responsible for the job shall print their name(s) below as verification that the work has been performed correctly and the form filled out accurately. Each responsible person shall list their identifying number (1, 2, 3, 4, or 5) in the "Signed by" column next to the results of the tasks they perform.

Responsible person 1: Simme W. Veldman	**Phone number:** (360)865-0197	**Date:** 6/10/22
Responsible person 2:	**Phone number:**	**Date:**
Responsible person 3:	**Phone number:**	**Date:**
Responsible person 4:	**Phone number:**	**Date:**
Responsible person 5:	**Phone number:**	**Date:**

Crew: SV Electrical Testing

Substation: Nutglade Work order: 10068419

Equipment Identification

PacifiCorp equipment / SAP number: 440074	Position number at substation (bay): 8G95
Manufacturer: G&W Electric Company	Model: VIP376ER-12S
Serial number: 202106280086	Manufacture date: 09-21
Substation Breaker Type: ☐ Vacuum Breaker ☑ Vacuum Recloser ☐ SF6 Bottle Breaker	
Mechanism model: VIP376ER-12S	Nameplate voltage (kV): 15.5
Mechanism type - Open: ☐ Pneumatic ☐ Hydraulic ☐ Spring ☑ Other	Operating voltage (kV): 4 kV
	Continuous current rating (amps): 630
Close: ☐ Pneumatic ☐ Hydraulic ☐ Spring ☑ Other	Interrupter rating (amps): 12,500
	Control voltage - motor: NA AC NA DC
BIL rating: 110 kV	Control voltage - trip: AC 12 DC
Instruction book number - breaker: Not Available	Control voltage - close: AC 12 DC
Instruction book number - mechanism: Not Available	Control cabinet battery pack (UPS): ☑ Yes ☐ No
Operations counter - AS FOUND: 43	Control cabinet battery pack voltage (V): 12
AS LEFT: 44	Control cabinet relay pack: ☑ Yes ☐ No

For results use A = acceptable, C = corrected, U = unacceptable, NA = not applicable to this equipment

For items marked 'C' or 'U' provide a detailed explanation in the comments section

General Inspection

	Signed by	Results
Inspect the breaker, insulators, bottles, high-voltage compartment, mechanism, etc. for signs of damage	1	A
Visually verify the condition of the bushings	1	A
Check the conduits for openings that could provide access to animals or insects	1	A
Inspect the cabinet filters and door gaskets and replace if necessary	1	A
Inspect all auxiliary contacts and mechanisms for proper operation and clean as necessary	1	NA

Install Circuit Breaker on Pad

	Signed by	Results
Install circuit breaker so that bushing current transformers are in the correct orientation	1	A
Install circuit breaker ground grid leads	1	A

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42	Install Circuit Breaker Control Wiring				
43				Signed by	Results
44	Install control wiring cables into circuit breaker control cabinet. Remove cable sheath and copper shield to the entrance point of the control cabinet			1	A
45	Install cable tags on all control cables bearing the cable number as shown on the substation conduit and cable schedule			1	A
46	Verify any control cables used for current transformer connections are of sufficient length to permit changing ratio or phasing			1	NA
47	Perform insulation resistance tests on all control wires prior to the leads being laid down using a 1000V DC insulation resistance tester. Measured insulation levels should exceed 1.0 megohms at 1000V DC			1	A
48	Install non-insulated type cable lug terminations on control wires with PacifiCorp approved ratchet-type compression tool. Verify any terminals with more that one conductor that the lower termination is reversed			1	A
49	Verify all #18 wire size cables are terminated with fork spades, and all current transformer and other circuits are terminated with ring terminals			1	NA
50	Verify tightness of all control wiring connections			1	A
51	Operating Mechanism				
52				Signed by	Results
53	Verify operation of the control cabinet heater(s) and record current readings below:			1	A
54	Heater 1: .94 amps	Heater 2: NA amps			
55	Heater 3: NA amps	Heater 4: NA amps			
56	Measure and record the trip / close coil resistance below:			1	NA
57	Close coil: ____ ohms	Trip coil 1: ____ ohms	Trip coil 2: ____ ohms		
58	Inspect the mechanism for loose or missing components and correct alignment			1	A
59	*Perform all equipment manufacturer's operating mechanism measurements. List checks and adjustments (such as trip latch clearance, latch check switch, trip coil plunger)*				
60		Mfr specs	As found	As left	Signed by	Results
61						
62						
63						
64						
65						
66	*Perform the following steps only on self-contained circuit breakers*					
67	☐ **NA** *Check box if task does not apply*					
68					Signed by	Results
69	Perform test of UPS battery system for proper function				1	A
70	High-Voltage Compartment					
71					Signed by	Results
72	Verify operation of high-voltage compartment heaters and record current readings below:				1	NA
73	Heater 1: ____ amps	Heater 2: ____ amps	Heater 3: ____ amps			
74	*Perform any additional equipment manufacturer's high-voltage compartment measurements. List checks and adjustments below*					
75		Mfr specs	As found	As left	Signed by	Results
76						
77						
78						

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High-Voltage Compartment, *continued*

Perform any additional equipment manufacturer's high-voltage compartment measurements. List checks and adjustments below

	Mfr specs	As found	As left	Signed by	Results

Vacuum / SF6 Bottle Integrity Tests

Perform vacuum / SF6 bottle contact wipe measurements and list results below

	Mfr specs	Measurement taken			Signed by	Results
		Pole 1	Pole 2	Pole 3		
Contact wipe					1	NA

Perform vacuum / SF6 bottle contact erosion measurements and list results below

	Mfr specs	Measurement taken			Signed by	Results
		Pole 1	Pole 2	Pole 3		
Contact erosion					1	NA

Before performing a vacuum / SF6 bottle integrity test, verify voltage requirements from manufacturer requirements

	Test voltage	Hipot voltage mfr specs	Pass / Fail			Signed by	Results
			Pole 1	Pole 2	Pole 3		
☑ AC ☐ DC	40 kV	No Arc	Pass	Pass	Pass	1	A

Contact Resistance Tests (from bushing to bushing)

If readings are high, isolate where the problem is (connections, bushings, contacts)

	Mfr specs	Measurement taken			Signed by	Results
		Pole 1	Pole 2	Pole 3		
Micro ohm reading	200	119.7	116.2	122.5	1	A

Insulation Resistance Tests

Perform insulation integrity tests phase to phase and phase to ground using a 5kV insulation test set. All readings should equal or exceed 1,000 megohms. Test breaker open across open contacts of each phase

	Measurements taken			Signed by	Results
Breaker closed	Ø1 - Gnd	Ø2 - Gnd	Ø3 - Gnd	1	A
	21,560	22,480	20,280		
	Ø1 - Ø2	Ø2 - Ø3	Ø3 -Ø1	1	A
	1,761,000	1,935,000	1,538,000		
Breaker open	Ø1 - Ø1	Ø2 - Ø2	Ø3 -Ø3	1	A
	5,472,000	6,728,000	5,980,000		

Install Animal Guard

	Signed by	Results
Install animal guard on bushings and conductor conduits per engineering standards	1	A

120	Final Test Reports and Installation Forms
121	*Submit all required test reports and installation forms to commissioning@pacificorp.com, including equipment removal forms*
122	Comments
123	*For items marked 'C' or 'U', list the associated line number, the defect, and what corrective actions were taken*
124	